

What is Claimed:

- Sub A1
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1. A method of de-fragmenting file allocations on a disk comprising:
determining what pages should be swapped among the various allocations made by the operating system (OS), the OS's file system mapping updated to reflect the swapped pages and a history of the original state prior to any update recorded by the engine, the swaps performed by manipulation of the engine's data structures and/or actually exchanging data on disk where OS visible data is read and written but the original state of each altered page is not directly recorded in the historic log, but instead, a record is additionally logged of the locations of the swapped data so that an image of the OS visible data can be reconstructed prior to time of the de-fragmentation by knowing what data to effectively re-swap and what OS mapping data to effectively restore.
 2. A method according to claim 1 wherein the method is performed on a computer wherein a history of data is maintained such the the computer can be returned to a state of data from an earlier point in time.
 3. A method of de-fragmenting file allocations on a disk according to claim 1, including the step of incorporating desired close proximity information of various OS visible pages into the algorithm executed by the engine that determines what is actually swapped, in order to reasonably maintain physical close proximity of data allocated by the OS but physically re-mapped by the engine.
 4. A method according to claim 3 wherein the method is performed on a computer wherein a history of data is maintained such the the computer can be returned to a state of data from an earlier point in time.

Sub A 1
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5. Apparatus comprising a machine readable medium having computer instructions embodied therein wherein the instructions carry out the method of claim 1 when executed on a suitably configured computer.

6. Apparatus comprising a machine readable medium having computer instructions embodied therein wherein the instructions carry out the method of claim 3 when executed on a suitably configured computer.

10 7. A system comprising a programmed computer including means for determining what pages should be swapped among the various allocations made by the operating system (OS), means for updating the OS's file system mapping to reflect the swapped pages and a history of the original state prior to any update recorded by the engine, means for performing the swaps by
15 manipulation of the engine's data structures and/or actually exchanging data on disk where OS visible data is read and written but the original state of each altered page is not directly recorded in the historic log, but instead, a record is additionally logged of the locations of the swapped data so that an image of the OS visible data can be reconstructed prior to time of the de-
20 fragmentation by knowing what data to effectively re-swap and what OS mapping data to effectively restore.

8. A system according to claim 1, including means for incorporating desired close proximity information of various OS visible pages into the algorithm
25 executed by the engine that determines what is actually swapped, in order to reasonably maintain physical close proximity of data allocated by the OS but physically re-mapped by the engine.

9. A method according to claim 4 wherein the historical data is maintained by diverting writes to a different position on the disk so historical data remains in its original location.